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Fragmentation of blocks: Possible relationship with exposure time on the lunar surface

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At the small spatial scale (<1 km), most of the rocky planetary surfaces can be described in morphological terms with three members: bedrock, block, and fine regolith particles. Several properties of blocks have been investigated in previous studies, such as their size-frequency distribution, height above the surroundings, spatial distribution, spatial density (e.g. 1, 2) and distance to source crater (e.g., 3-6). Block clustering appears to be a ubiquitous morphology but has not been thoroughly investigated. Block clustering has been the object of two studies on asteroid surfaces (7, 8) but not on larger planetary bodies. Here we refer to the clusters formed by fragmentation or erosion in place and not as fields of ejecta blocks or rock fall deposits. In order to assess any variability of block clusters as a function of exposure time, we investigated clusters on the rim of lunar impact craters of known age (9). These craters are all relatively young (Copernican) and are rich in exposed rocks, as previously shown with thermal inertia measurements (9) and rock abundance studies (10). We studied both the morphology and the morphometry of block clusters. Preliminary results indicate that only a fraction of all exposed blocks are fractured and that cluster morphologies change with crater age. In particular, clusters in older craters are more loosely packed than in younger craters. We suggest that this trend might be due to a progressive destruction with time. Both abrasion by micrometeorite bombardment and small high velocity impactors (macrometeorites) might play a role in eroding and fragmenting blocks. [1] Golombek et al., (2008) JGR, 113, E00A09. [2] Di et al., (2016) PSS, 120, 103-112. [3] Kueppers et al., (2012) PSS, 66, 71-78. [4] Thomas et al., (2000) JGR, 106, E6, 15,091-15,106. [5] Bart and Melosh, (2010) Icarus, 209, 337-357. [6] Schulzeck et al., (2018) PSS, 153, 142-156. [7] Dombard et al., (2010) Icarus, 210, 713-721. [8] Nakamura et al., (2008) EPS, 60, 7-12. [9] Ghent et al., (2014) Geology, doi:10.1130/G35926.1. [10] Basilevesky et al., (2015) PSS, 117, 312-328.